Midwest Technology Assistance Center
Groundwater Resource Assessment for Small Communities

Groundwater Availability
At
Beason Chestnut PWD, Illinois
(Logan County)

Project Overview

This project is an outgrowth of the Public Service Program of the Center for Groundwater Science (CGS) at the Illinois State Water Survey. For over 50 years, the CGS has provided groundwater information to any requesting individual, commercial facility or public water facility. Groundwater resource assessments have been an integral part of this public service and have been undertaken for thousands of individuals and facilities throughout its history. Community groundwater supplies that have been identified as potentially "deficient" are the targets for this project. The criterion used for determining community deficiency were; 1) Water Supply and Demand (operating time), 2) Aquifer Limitation, 3) Well Specific Capacity, and 4) Facility History. The Village of Beason Chestnut PWD has been identified as a target community for groundwater assessment through this project.

Project Goal

To provide a resource tool of pertinent groundwater information to each target facility. This document describes a summary of historic information, current conditions and the potential for expansion of the water supply within 5 and 10 miles of Beason Chestnut PWD.

Beason Chestnut PWD (Logan County)

The Beason-Chestnut Public Water District (Facility Number 1075150) utilizes one active community water supply well. Well No. 1 (Illinois EPA #58042) supplies an average of 43,100 gallons per day (gpd) to 198 services or a population of 600. It supplies water to both the Village of Beason, located about five miles north of their well supply and the Village of Chestnut, located about one mile to the south of the well supply.

The project criterion ranked Beason Chestnut PWD as “marginal” mainly due to its shallow water table well, a history of searching for the minimal groundwater supply currently utilized, and the problems associated with those searches due to the highly variable sand formations found throughout this area.

Historic Information

Background Well Information

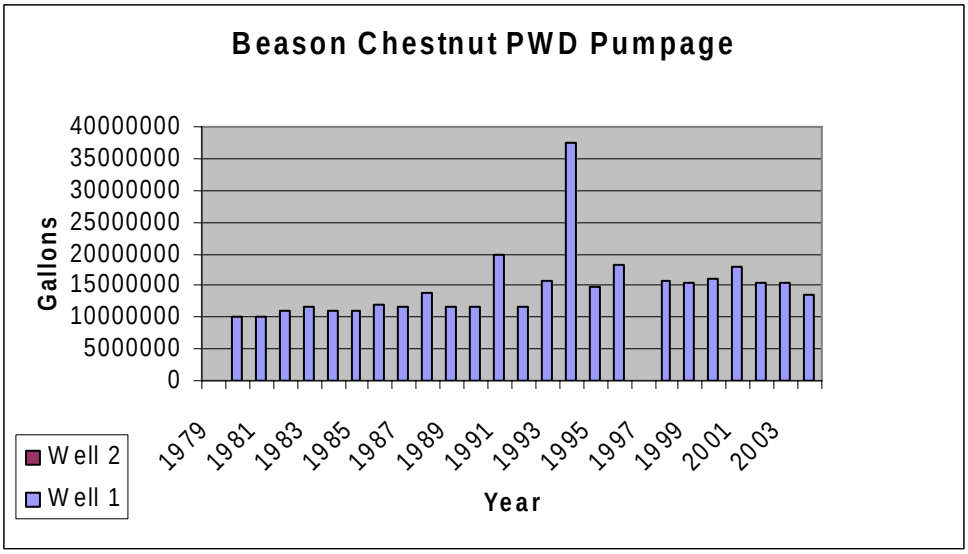
Well No.1

Finished in shallow sand and gravel deposits located in Section 26, T.19N., R.1W., Logan County. The well was drilled to a depth of 50 feet in 1972 and, upon completion, reportedly produced 125 gpm for 3 hours with 6.5 feet of drawdown. Calculated specific capacity from this test was 19.2 gpm/ft. Static water level was reported as 13.0 feet below land surface.

Well No.2

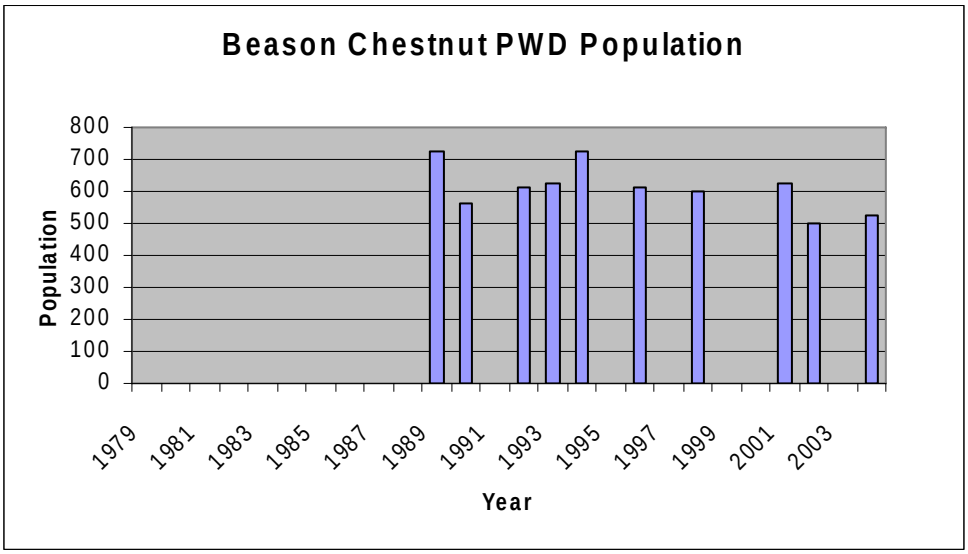
Finished in shallow sand and gravel deposits located in Section 26, T.19N., R.1W., Logan County. The well was drilled to a depth of 48 feet in 2004 as a backup for Well No.1. The pump is rated at 120 gpm and a static was reported at 12.0 feet below land surface.

Background Pumpage Information



Source: ISWS Illinois Water Inventory Program

Historic Population Information



Source: ISWS Illinois Water Inventory Program

Regional Information

Resources within 5 miles of Beason Chestnut PWD (Figure 1).

Domestic Groundwater Supplies
The available regional data indicate that groundwater for domestic and farm use in this part of Illinois is obtained from large-diameter bored wells and from small-diameter drilled wells finished in the unconsolidated materials above bedrock. The large-diameter bored wells tap stringers or lenses of silt, sand, or gravel only a few inches thick contained in the unconsolidated materials above bedrock. They range in depth from about 26 to 65 feet. The yield of this type of well is limited to a few hundred gallons per day and may be only barely adequate for normal household uses.

The small-diameter (4- to 6-inch) drilled wells are finished within sand and gravel deposits found within the unconsolidated material above bedrock. These wells range in depth from 37 to 93 feet. Upon completion, these wells were pumped at rates of 3 to 60 gallons per minute for short periods of time.

Municipal Groundwater Supplies
There is one town located within five miles of the Beason Chestnut PWD well field; the Village of Kenney to the northeast. Kenney currently uses one well located in Section 16, T.19N., R.1E., DeWitt County. The well is finished within sand and gravel deposits associated with the west flank of the Mahomet Buried

Bedrock aquifer at a depth of 255 feet. Upon completion, this well was pumped at a rate of about 150 gallons per minute (gpm) for over 5 hours.

Resources within 10 miles of Beason Chestnut PWD (Figure 2).

Municipal Groundwater Supplies
Towns within 5 to 10 miles of Beason Chestnut PWD include: Midland City and Hallsville in DeWitt County, and Chestervale, Mt. Pulaski, and Latham all located within Logan County. Midland City, Hallsville, and Chestervale do not have public water supply facilities. It is assumed that private domestic well supplies furnish the residents of these towns with their current water needs.

The Village of Latham, located about 6 miles south of Chestnut, currently uses three wells for its supply. Their main well (Well No. 6), is located in Section 10, T.17N., R.1W. Logan County. This well is pumped at around 100 gpm to secure the village needs. The other two wells (Nos. 2 and 4), are used a backups and are both located in Section 35, T.18N., R.1W., Logan County. These wells, when used, are pumped at a total rate of about 50 gpm and are used only when Well No. 6 requires service. All three wells are finished in alluvial sand and gravel deposits associated with South Fork Creek. Well No. 6 if finished at a depths of 75 feet, Well No. 2 at a depth of 74 feet, and Well No. 4 at a depth of 67 feet below land surface. Upon completion, these wells were pumped at rates of 70 to 100 gpm for short periods of time.

The City of Mt. Pulaski, located about 6 miles to the southwest of Chestnut, currently uses three wells for their water supply. These wells are all located in Section 35, T.19N., R.2W., Logan County. They are finished within the alluvial deposits of Salt Creek at depths ranging from 32 to 39 feet below land surface. These wells are pumped at rates of 75 to 150 gpm for their supply.

Figures 3 and 4 picture the ISWS Potential Yield maps for sand and gravel and bedrock aquifers in Illinois, respectively. The pertinent counties for Beason Chestnut PWD are highlighted. Figure 3 indicates that sand and gravel deposits are variable throughout the Beason Chestnut PWD area with the Mahomet aquifer system prominent to the northeast near Kenney. The bedrock map (Figure 4) indicates poor availability of groundwater from the bedrock throughout the Beason Chestnut PWD area. Figures 5 and 6 present the probability of occurrence of the sand and gravel and the water-yielding character of the shallow bedrock for the Beason Chestnut PWD area as depicted in the Illinois State Geologic Survey Circular 248, *Groundwater Geology in East-Central Illinois* (Selkregg, et al., 1958). Figure 5 indicates “Fair to Good,” variable and discontinuous sand and gravel deposits and Figure 6 indicates only small supplies are available from the shallow bedrock units. The domestic well construction records verify these map outlooks.

Figure 1. 5-mile radius map- Beason-Chestnut PWD

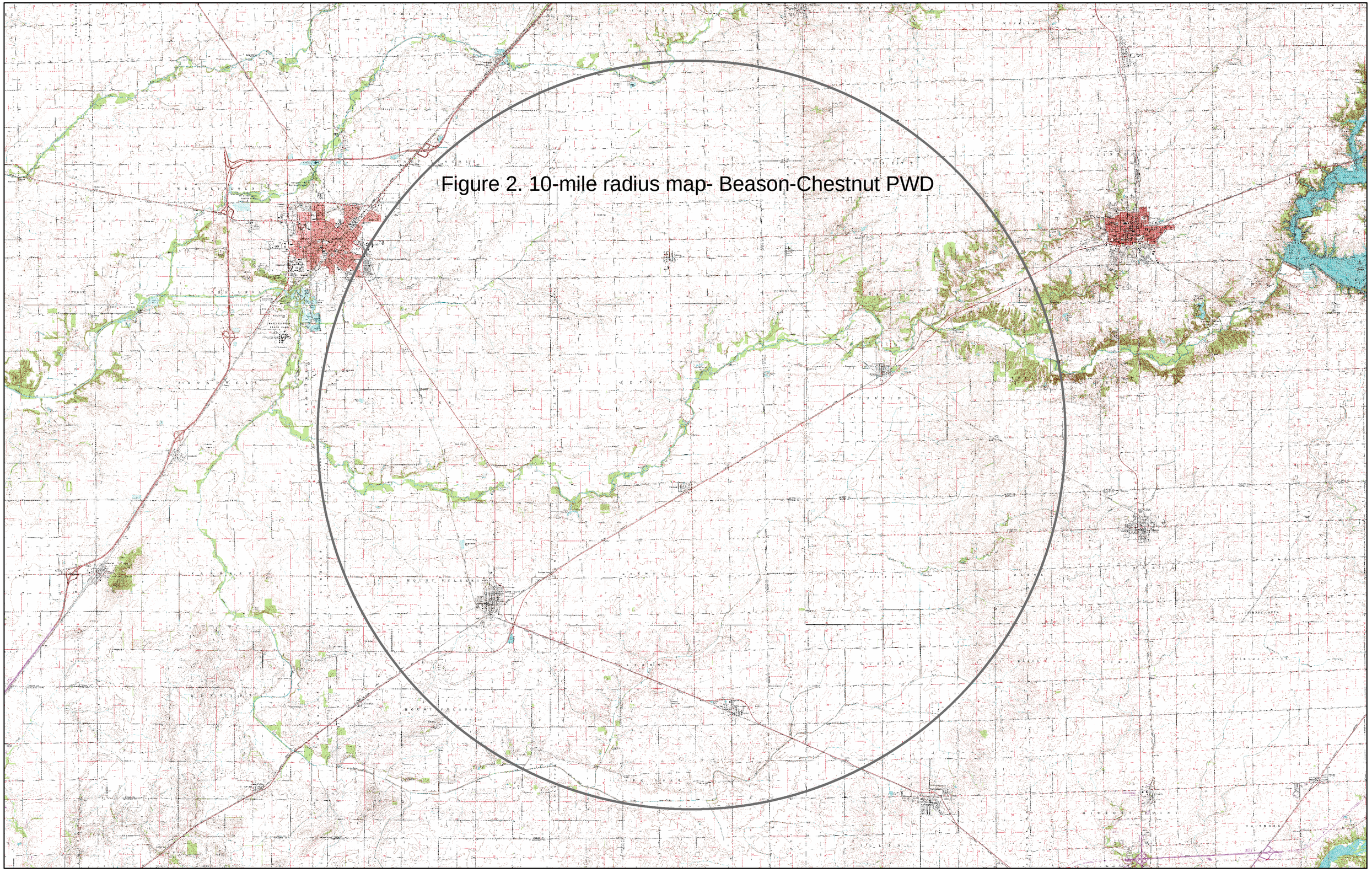


Figure 2. 10-mile radius map- Beason-Chestnut PWD

Groundwater Availability Summary

The available information indicates the sand and gravel deposits that the Village uses are capable of supplying the current needs of the town; however, our files indicate that when Well No. 2 was drilled, a layer of fine sand was encountered that was not present in Well No. 1. In 2004, conversations with Vernon Baker of E.C. Baker and Sons, Inc. (well contractors in Sigel Illinois), indicated the village was exploring the possibility of another well in this general location. A drilling attempt indicated clay and sand layers that differed in the new area but still produced around 75gpm from a test well. It is unclear as to whether a new well (Well No. 3) was finished for the village at this site. These reports indicate that the geology in this area can vary greatly over small distances. Developing new wells within a few hundred feet of the existing well field may not be in the best interests of securing a long-term solution for new development. It appears that there are sands within a relatively close proximity to the existing well field that have the potential for development, should the village need to expand their supply. However, exploration and development may be costly because of the variability of these deposits. The Electrical Earth Resistivity conducted in 1966 (Figure 7) also recommended sites in Sections 33 and 34 that may have a good potential for exploration. Developing a well or well field in a new location, away from Section 26, would minimize the potential interference effects that are possible within the variable sands of the existing well field. It does not appear that any exploration was conducted in Sections 33 or 34 and this would be highly recommended should the village need to expand their supply. The buried sands of the Mahomet aquifer system to the northeast of the current well field would also be a possibility for new development. The Village of Kenney uses a well within this system and it is a reliable source of good quality groundwater. However, the distance to this aquifer would most likely prove too costly for development. The alluvial sand and gravel deposits associated with Salt Creek appear to be capable and the most practical source for expansion of the Beason-Chestnut water supply.

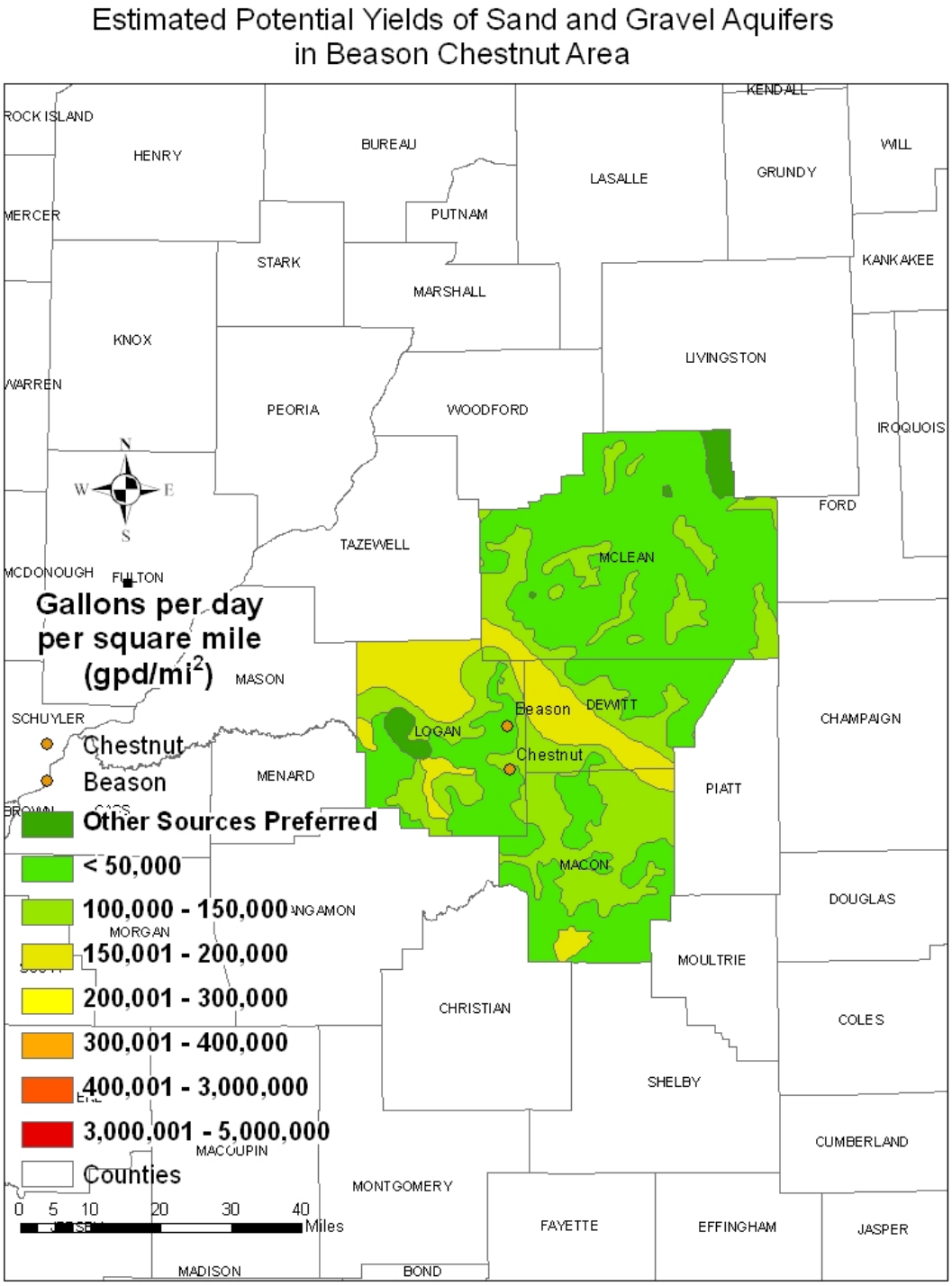

Estimated Potential Yields of Sand and Gravel Aquifers
in Beason Chestnut Area
ROCK ISLAND
HENRY
BUREAU
LASALLE
KENDALL
GRUNDY
WILL
MERCER
PUTNAM
STARK
MARSHALL
KANKAKEE
KNOX
LIVINGSTON
WARREN
PEORIA
WOODFORD
IROQUOIS
FORD
TAZEWELL
MCLEAN
MCDONOUGH
FULTON
MASON
SCHUYLER
Beason
DEWITT
LOGAN
Chestnut
CHAMPAIGN
MENARD
PIATT
MACON
DOUGLAS
MORGAN
MOULTRIE
CHRISTIAN
COLES
SHELBY
CUMBERLAND
MACOUPIN
MONTGOMERY
FAYETTE
EFFINGHAM
JASPER
MADISON
BOND
N
W
E
S
Gallons per day
per square mile
(gpd/mi2)
Chestnut
Beason
Other Sources Preferred
< 50,000
100,000 - 150,000
150,001 - 200,000
200,001 - 300,000
300,001 - 400,000
400,001 - 3,000,000
3,000,001 - 5,000,000
Counties
0 5 10 20 30 40
Miles

Figure 3.

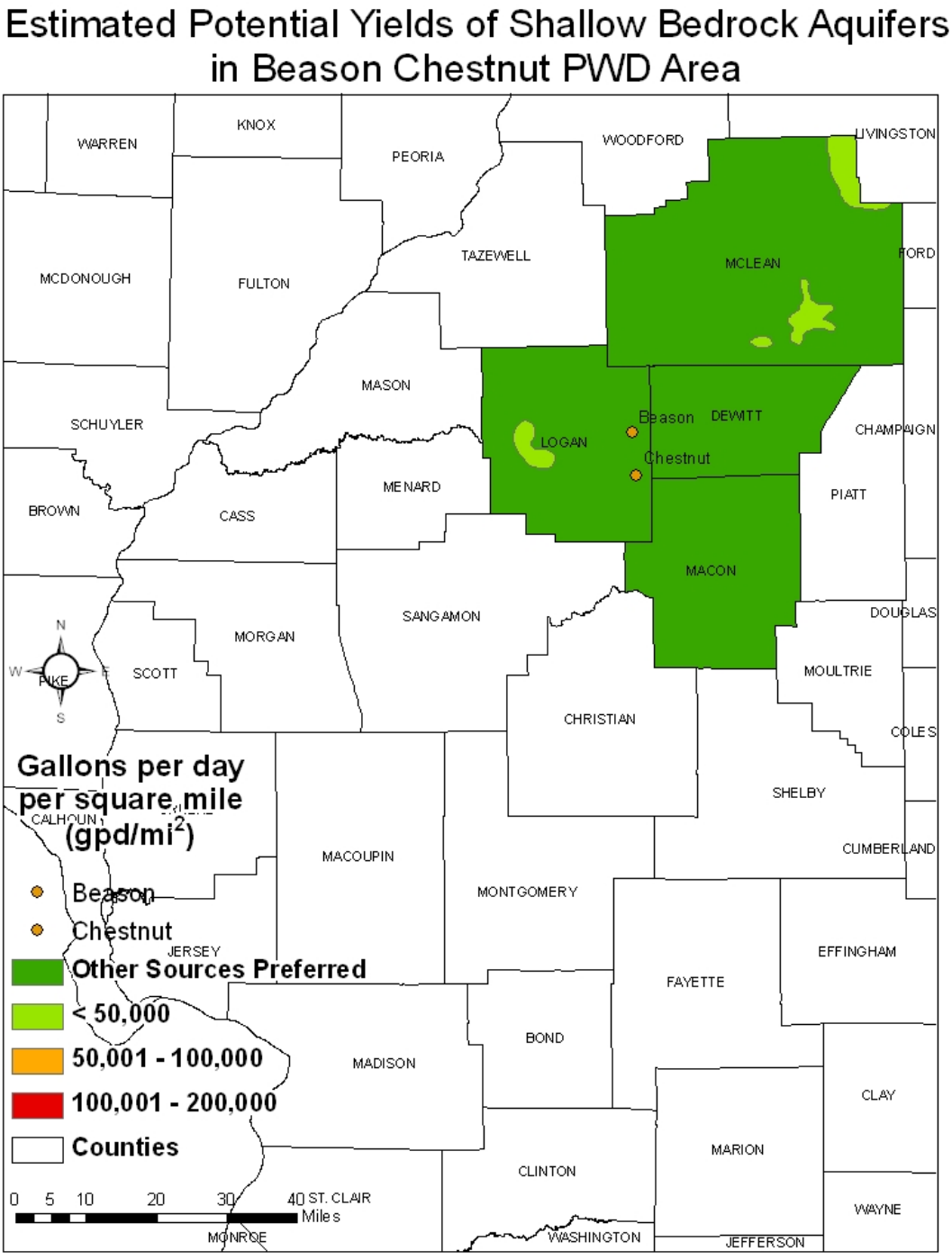

Estimated Potential Yields of Shallow Bedrock Aquifers
in Beason Chestnut PWD Area
WARREN
KNOX
PEORIA
WOODFORD
LIVINGSTON
MCDONOUGH
FULTON
TAZEWELL
MCLEAN
FORD
MASON
SCHUYLER
Beason
DEWITT
LOGAN
Chestnut
CHAMPAIGN
MENARD
BROWN
CASS
PIATT
MACON
SANGAMON
DOUGLAS
MORGAN
N
W
E
S
PIKE
SCOTT
MOULTRIE
CHRISTIAN
COLES
SHELBY
CALHOUN
MACOUPIN
CUMBERLAND
MONTGOMERY
Gallons per day
per square mile
(gpd/mi2)
Beason
Chestnut
JERSEY
Other Sources Preferred
< 50,000
EFFINGHAM
FAYETTE
50,001 - 100,000
BOND
MADISON
100,001 - 200,000
CLAY
Counties
MARION
CLINTON
0 5 10 20 30 40 ST. CLAIR
Miles
WAYNE
MONROE
WASHINGTON
JEFFERSON

Figure 4.

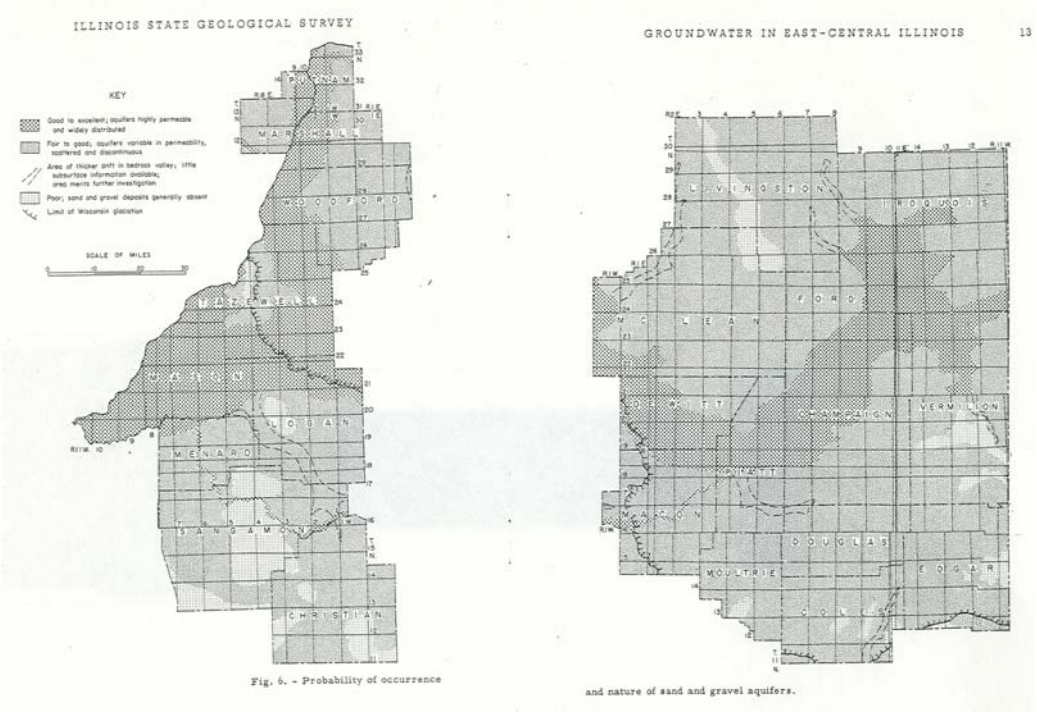


Fig. 6. - Probability of occurrence and nature of sand and gravel aquifers.

Figure 5.

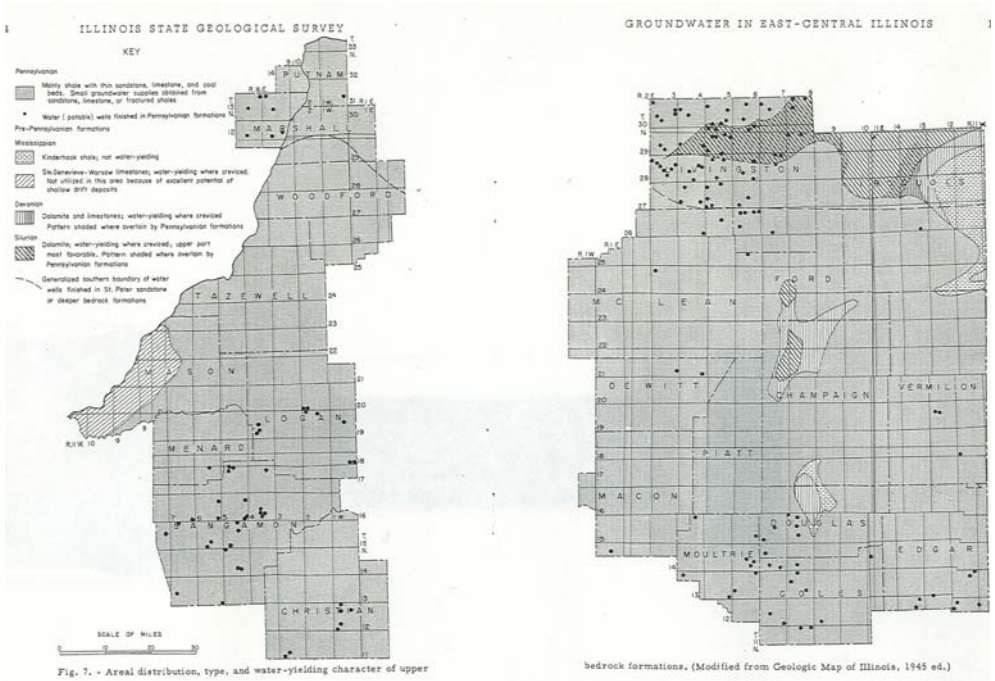


Fig. 7. - Areal distribution, type, and water-yielding character of upper bedrock formations. (Modified from Geologic Map of Illinois, 1945 ed.)

Figure 6.

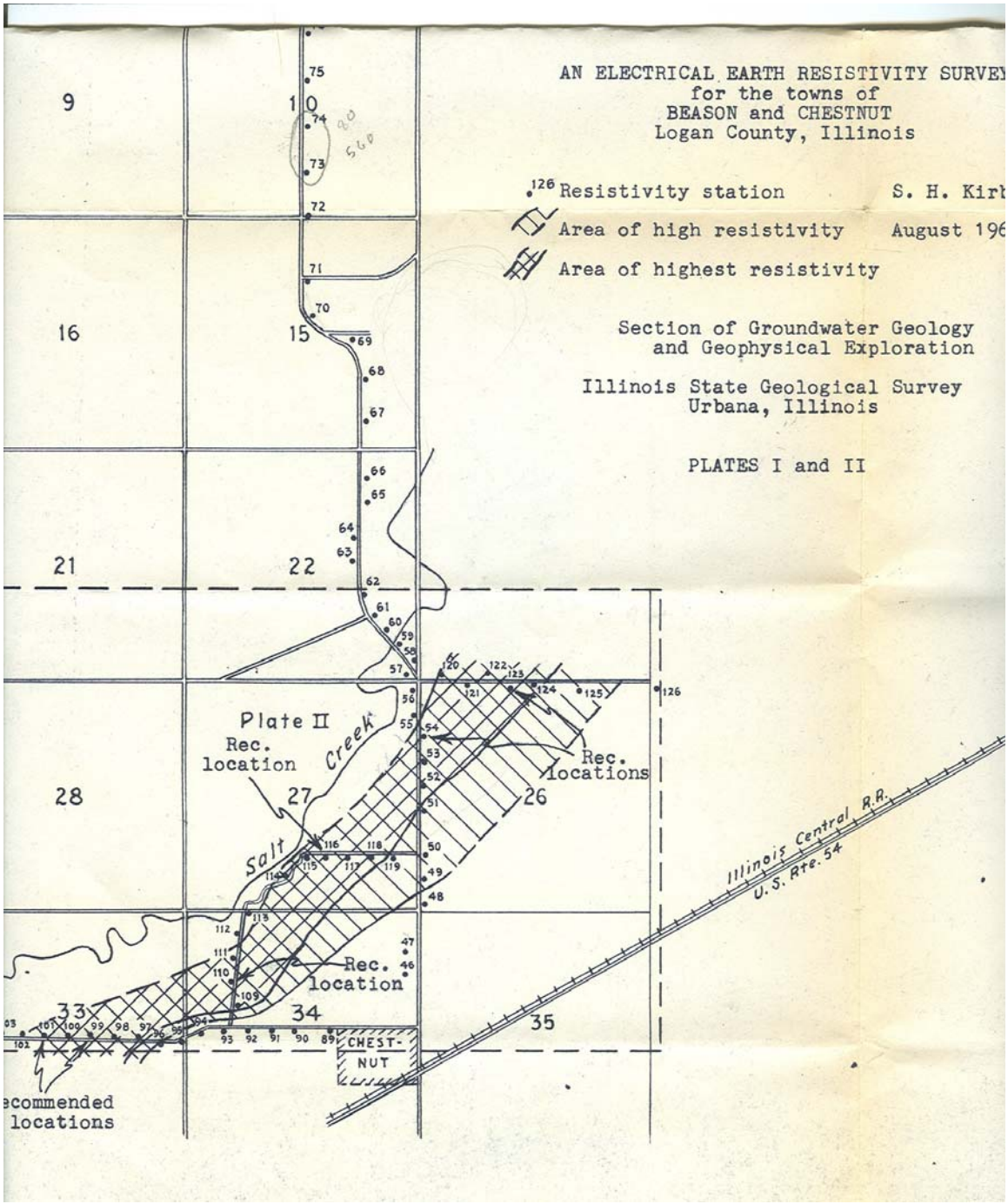


Figure 7. Electrical Earth Resistivity for Beason-Chestnut Rural Water District, 1966.

References

Selkregg, L.F. and J. Kempton. 1958. Groundwater Geology In East-Central Illinois, A preliminary Geologic Report. Illinois State Geological Survey Circular 248.

ISWS publications list for the Beason Chestnut PWD and surrounding areas.

DEWITT

*1961	RI-40	Hydrologic budgets for three small watersheds in Illinois. Schicht-Walton. 40p.
*1966	RI-55	Yields of wells in Pennsylvanian and Mississippian rocks in Illinois. Csallany. 42p.
*1969	RI-62	Groundwater resources of the buried Mahomet Bedrock Valley. Visocky- Schicht. 52p.
1982	COOP-8	Hydrogeologic evaluation of sand and gravel aquifers for municipal groundwater supplies in East-Central Illinois. Kempton-Morse-Visocky. 59p.
*1982	CR-299	A summary of information related to the comprehensive management of ground water and surface water resources in the Sangamon River Basin, Illinois. O'Hearn-Williams. 145p.
1992	COOP-13	Regional groundwater resources in Western McLean and Eastern Tazewell Counties with emphasis on the Mahomet Bedrock Valley. Kempton-Visocky. 46p.
1996	CR-589	Reconnaissance Study of Ground-Water Levels and Withdrawals in the Vicinity of DeWitt and Piatt Counties. Anliker-Sanderson. 83p.
1999	CR-642	Long-term ground-water level monitoring network and Aquifer Hydrologic Properties Database for DeWitt, Piatt, and Northern Macon Counties. Anliker. 24p.

LOGAN

*1965	RI-53	Potential yield of aquifers in Embarras River Basin, Illinois. Walton-Csallany. Open File Report.
1965	RS-48	Relationship between water use and population in the Embarras River Basin, Illinois. Csallany.
*1966	RI-55	Yields of wells in Pennsylvanian and Mississippian rocks in Illinois. Csallany. 42p.
*1969	RI-62	Groundwater resources of the buried Mahomet Bedrock Valley. Visocky-Schicht. 52p.
*1978	CR-196	Water supply alternatives for the city of Danville. Singh. 124p.
*1978	CR-199	Reconnaissance study of final cut impoundments. Gibb-Evans. 101p.
*1978	CR-209	Assessment of public groundwater supplies in Illinois. Visocky-Wehrmann-Kim- Ringler. 193p.
*1980	CR-237	Assessment of eighteen public groundwater supplies in Illinois. Wehrmann- Visocky-Burris-Ringler-Brower. 185p.
1982	COOP-8	Hydrogeologic evaluation of sand and gravel aquifers for municipal groundwater supplies in east-central Illinois. Kempton-Morse-Visocky. 59p.
1985	COOP-10	Geology, hydrology, and water quality of the Cambrian and Ordovician Systems in northern Illinois. Visocky-Sherrill-Cartwright. 136p.

MACON

*1969	RI-62	Groundwater resources of the buried Mahomet Bedrock Valley. Visocky-Schicht. 52p.
*1978	CR-209	Assessment of public groundwater supplies in Illinois. Visocky-Wehrmann-Kim- Ringler. 193p.
1981	COOP-6	Assessment of a regional aquifer in central Illinois. Burris-Morse-Naymik. 77p.

1982 COOP-8 Hydrogeologic evaluation of sand and gravel aquifers for municipal groundwater supplies in east-central Illinois. Kempton-Morse-Visocky. 59p.

*1982 CR-299 A summary of information related to the comprehensive management of groundwater and surface water resources in the Sangamon River Basin, Illinois O'Hearn-Williams. 145p.

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MCLEAN

*1961 RI-40 Hydrologic budgets for three small watersheds in Illinois. Schicht-Walton. 40p.

*1965 RI-48 Ground-water recharge and runoff in Illinois. Walton. 55p.

*1969 RI-62 Groundwater resources of the buried Mahomet Bedrock Valley. Visocky-Schicht. 52p.

1970 RS-148 Estimating the ground-water contribution to storm runoff by the electrical conductance method. Visocky.

*1978 CR-209 Assessment of public groundwater supplies in Illinois. Visocky-Wehrmann- Kim-Ringler. 193p.

*1981 CR-248 Surface water - groundwater quality relationships for a central Illinois Watershed. Gibb-O'Hearn. 41p.

*1982 C-153 A reassessment of aquifer conditions west of Normal, Illinois. Richards-Visocky. 33p.

$1982 C-154 Water level trends, pumpage, and chemical quality in the Cambrian-Ordovician aquifer in Illinois, 1971-1980. Sasman-Benson-Ludwigs-Williams. 64p. $5.00.

*1982 CR-299 A summary of information related to the comprehensive management of groundwater and surface water resources in the Sangamon River Basin, Illinois. O'Hearn-Williams. 145p.

1985 COOP-10 Geology, hydrology, and water quality of the Cambrian and Ordovician Systems in northern Illinois. Visocky-Sherrill-Cartwright. 136p.

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